Planning your data management

Connie Clare & **Eirini Zormpa**

EMBL-EBI Bioinformatics for Principle Investigators

16 June 2021 (Day 2), 13:30-16:30

DOI 10.5281/zenodo.4906555

4TU.ResearchData

SCIENCE • ENGINEERING • DESIGN

Who are we?

Connie Clare

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Community Manager

4TU.ResearchData

Eirini Zormpa

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Trainer on RDM & Open Science

4TU.ResearchData, TU Delft

Agenda

Part 1: 13:30 - 15:00 **Introduction to Data Management Plans**

- **What** is a DMP? (Connie)
- **Why** do we need DMP? (Connie)
- **What** needs to be included in a DMP? (Eirini)

Q& A: 15:00 - 15:20

Part 2: 15:20 - 16:20 **How to create a DMP using DMPonline**

- **Create** a data management plan using an online tool.
- **Peer review** a colleague's data management plan.

General information

- In this session we'll primarily be talking about data, but the course content also applies to software code.
- Part 2 will be interactive and you'll work in pairs.

Who are you?

Head to www.menti.com

Use code: 3888 8929

Part I:
An introduction to DMPs

- **What is a DMP?**
- Why do we need DMPs?
- What needs to be included in a DMP?

What is a data management plan?

A data management plan (DMP) is **a formal document** that outlines **how** data are to be handled both **during** a research project and **after** the project is completed.

The **goal** of a data management plan is to consider the many aspects of:

- Data management (throughout the research lifecycle)
- Metadata generation (documentation of your data)
- Data preservation (storage, archiving and publishing)
- Analysis before the project begins

Leads to data being better managed and prepared for preservation in the future.

Note: The DMP is a **living document** that should be updated (yearly)!

- What is a DMP?
- **Why do we need DMPs?**
- What needs to be included in a DMP?

Why do we need DMPs?

Data management plans can help **you**:

1. Feel **confident** about your research.
2. Work **reproducibly** and with **research integrity**.
3. **Comply** with **policy** requirements.

Benefit #1. Confidence in your research.

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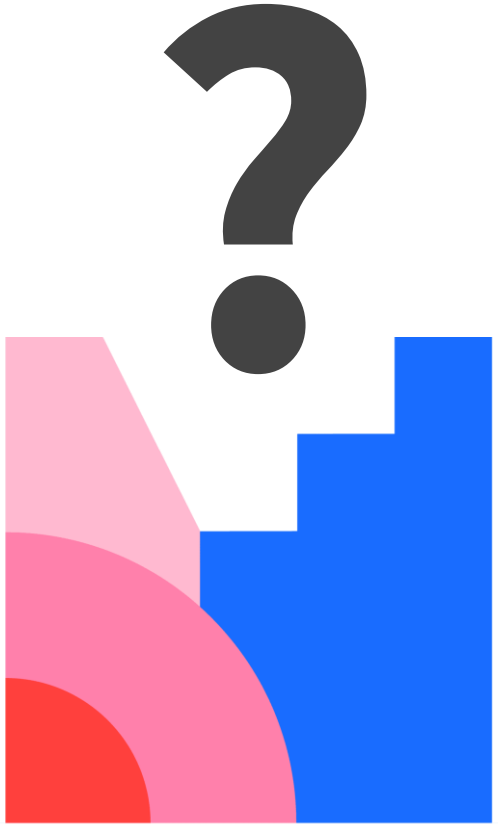

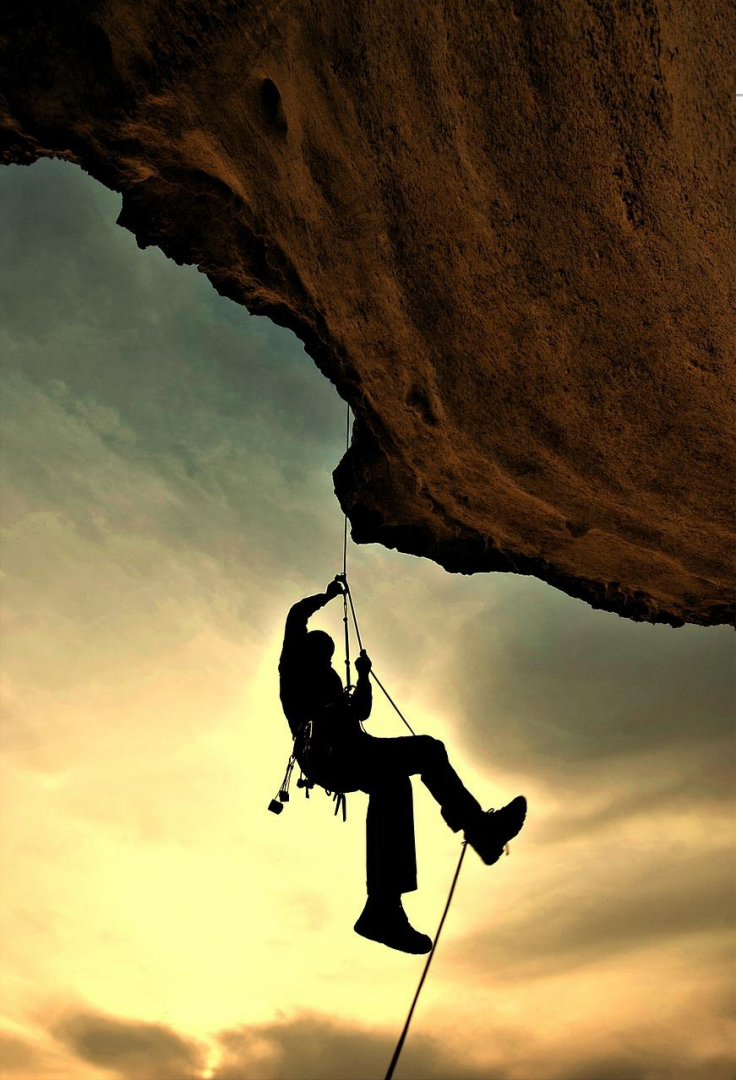

The challenges

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Image by aatlas from Pixabay

“It would take me 5 years to find all my data.”

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Image by Ag Ku from Pixabay

“The researcher who had the data has left the lab. I don’t know where it is.”

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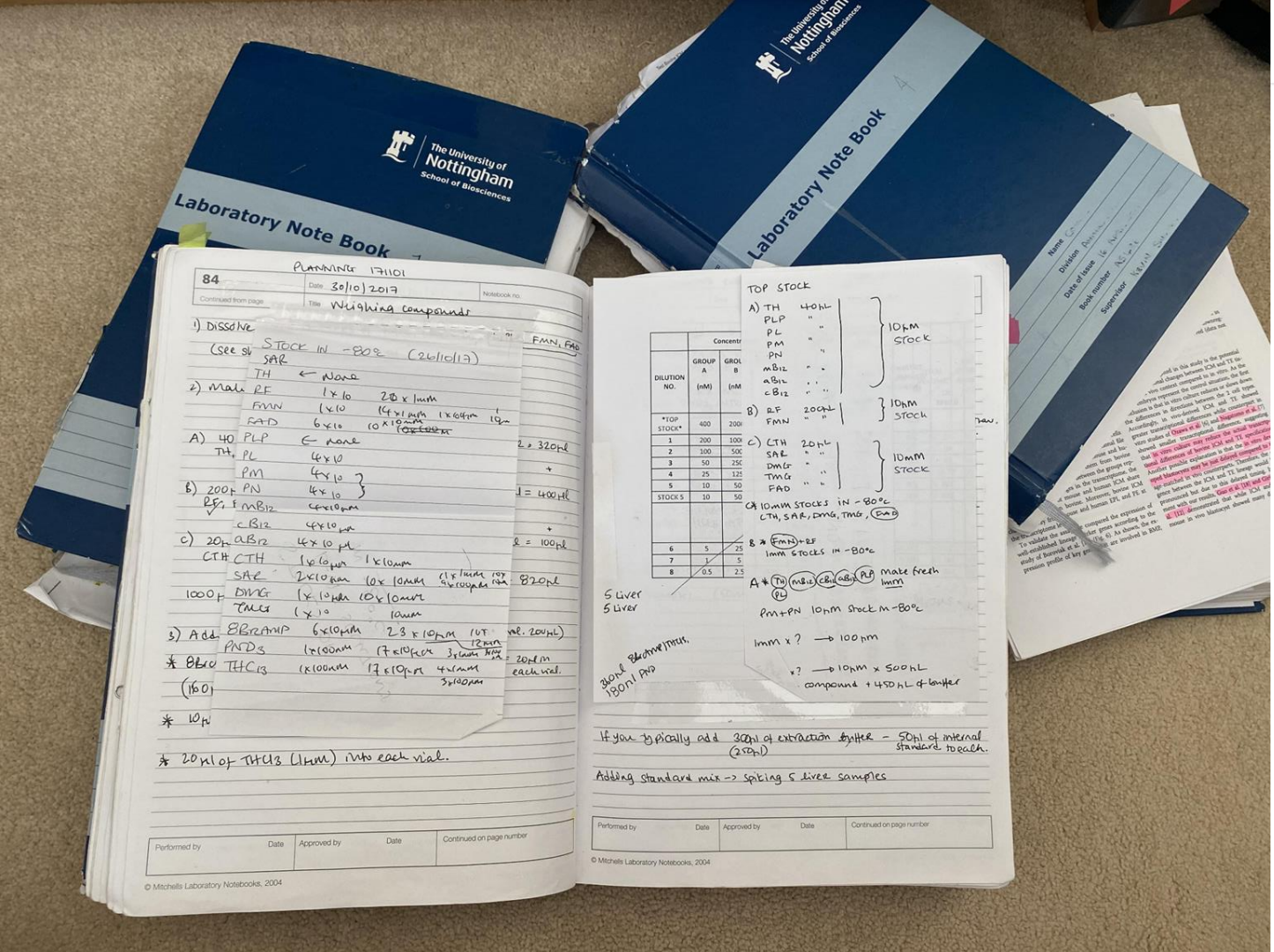
Image by Michal Jarmoluk from Pixabay



“The data was collected a long time ago. I can’t remember the protocol details.”

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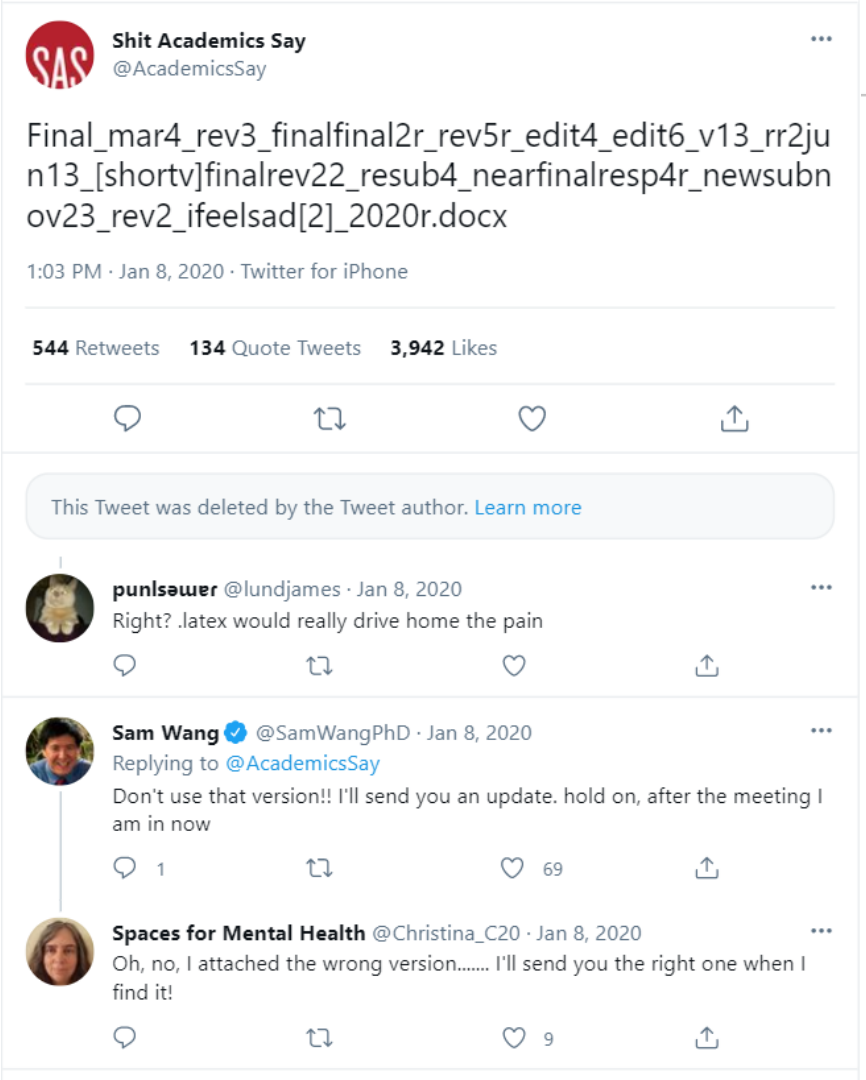
Image by Connie Clare.



"I don't know which data is the correct version I used for my analysis."

"I attached the wrong version. I'll send you the right one when I find it."

https://twitter.com/AcademicsSay/status/1214895436839968774

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“There’s no point in publishing my data. Nobody will understand it… My data is not valuable.”

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Image by Belova59 from Pixabay

Code availability

The code that supports the findings of this study is available from the corresponding authors upon reasonable request.

Data availability

The data that support the findings of this study are available from the corresponding authors upon reasonable request.

“People can just ask for my data when they need it.”

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Feeling confident about your research: How can a DMP help?

Image by StockSnap from Pixabay

You have a written plan, guidance & roadmap
= better project organisation.

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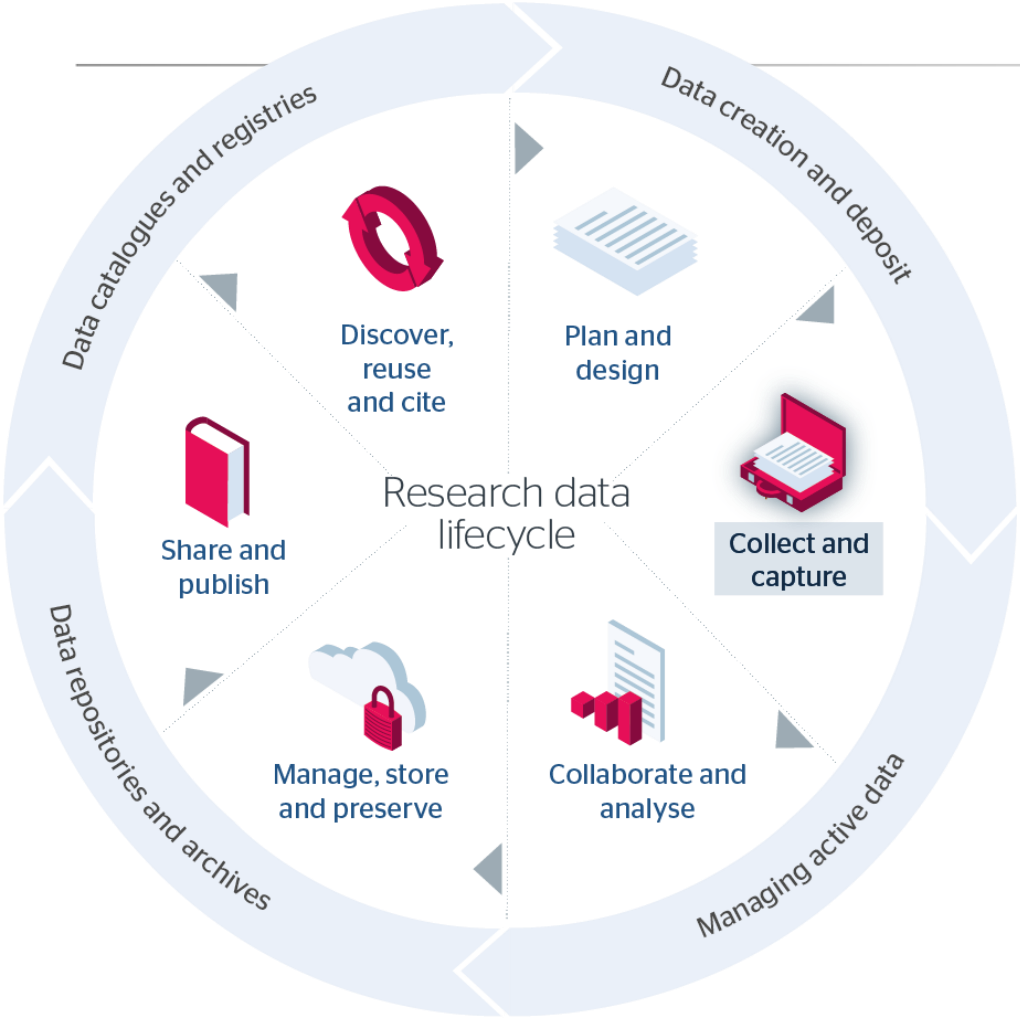

Guides you through the research lifecycle.

You are less likely to get lost in your own data.

You are more likely to create better quality data.

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(, no modifications)

This can lead to a more efficient workflow.

Planning saves time, money and resources…
(Less stress!)

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mage by Free-Photos from Pixabay

You can manage collaborations (internal and external).

Stakeholders have access to the right data at the right time.

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Image by mohamed Hassan from Pixabay

- You can ensure long-term preservation of your data.
- Make your data available for reuse.
- Get credit for your data (citations).
- Comply with policy.
- Secure future grants.

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Image by WikiImages from Pixabay

*"A good data management plan will make you **work more efficiently** on your research. Thinking about your data at the beginning of your research will help to **prevent future problems** and can lead to a **larger impact** of your research."*

Simone Fricke, data steward (ET, ST)

*“A DMP is a **living document** that makes the researcher think about their **data management needs** and l**ayout a plan** to **address them**. A good DMP is the first step in **effectively managing research data**.”*

Santosh Ilamparuthi, data steward (EEMCS)

*"Writing a DMP will help you as a researcher to consider aspects such as **file formats**, **storage requirements**, **ethics**, **copyright**, **accessibility** of data for others, **intellectual property** and **data archiving** during the early stage of your project."*

Michelle Kip & Ria Wolkorte, post-doctoral researchers
Health, Technology and Services

Benefit #2. You can work more reproducibly.

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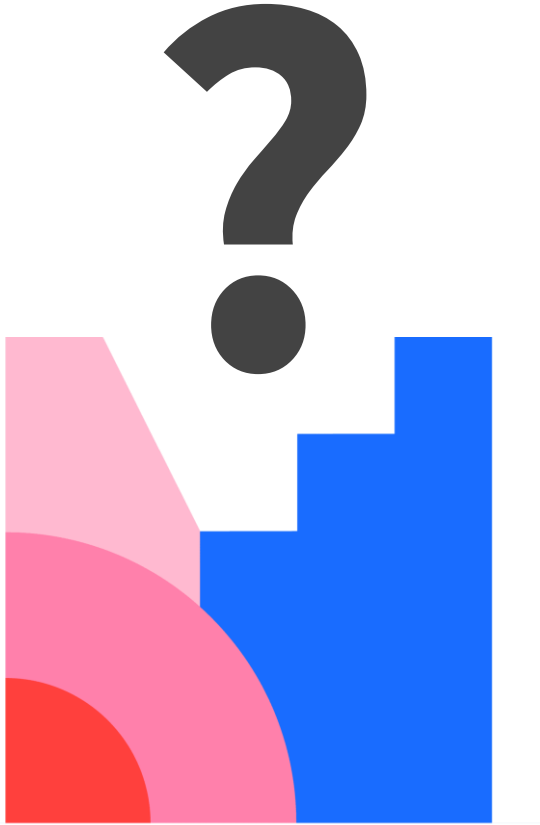

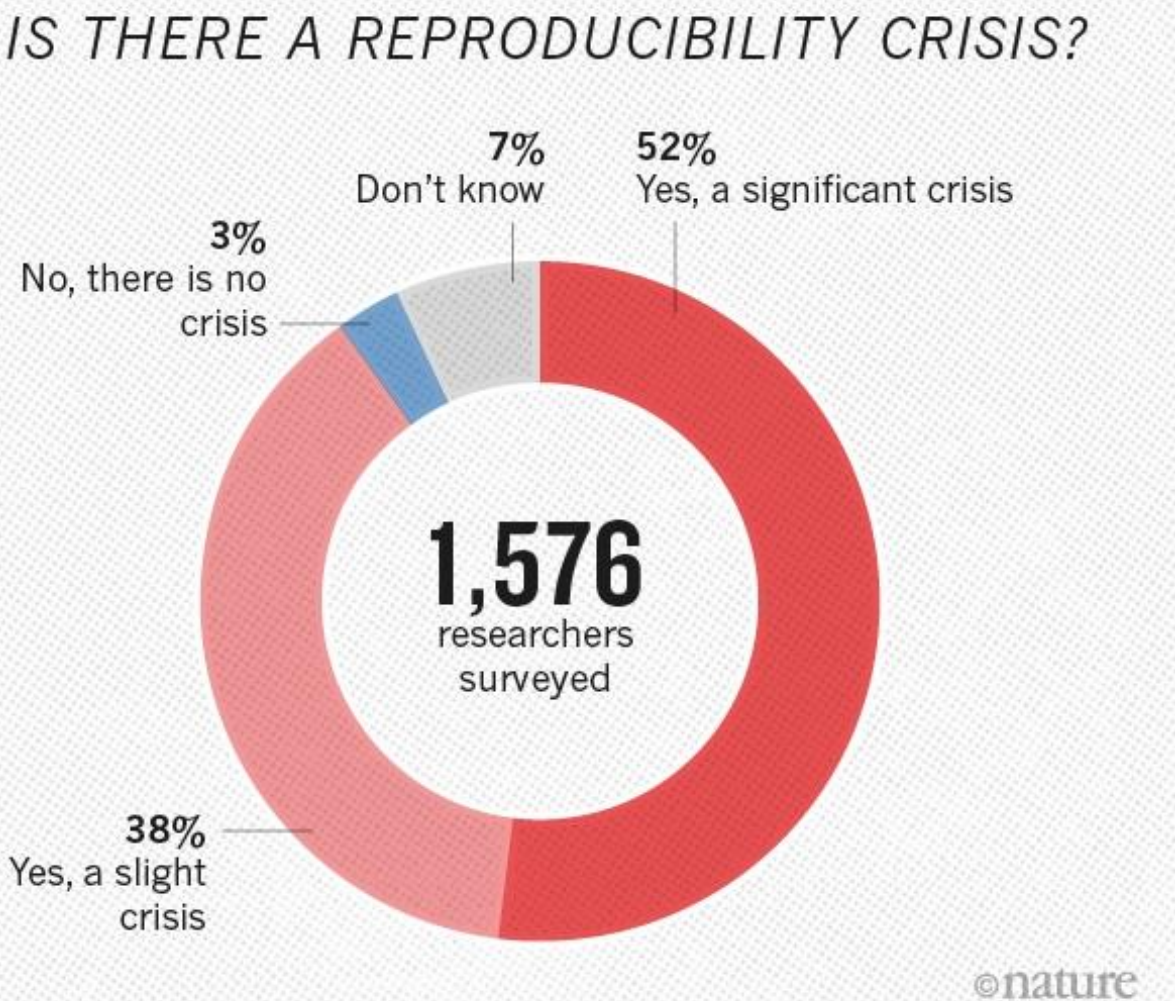

90% of researchers believe there is a **reproducibility crisis**.

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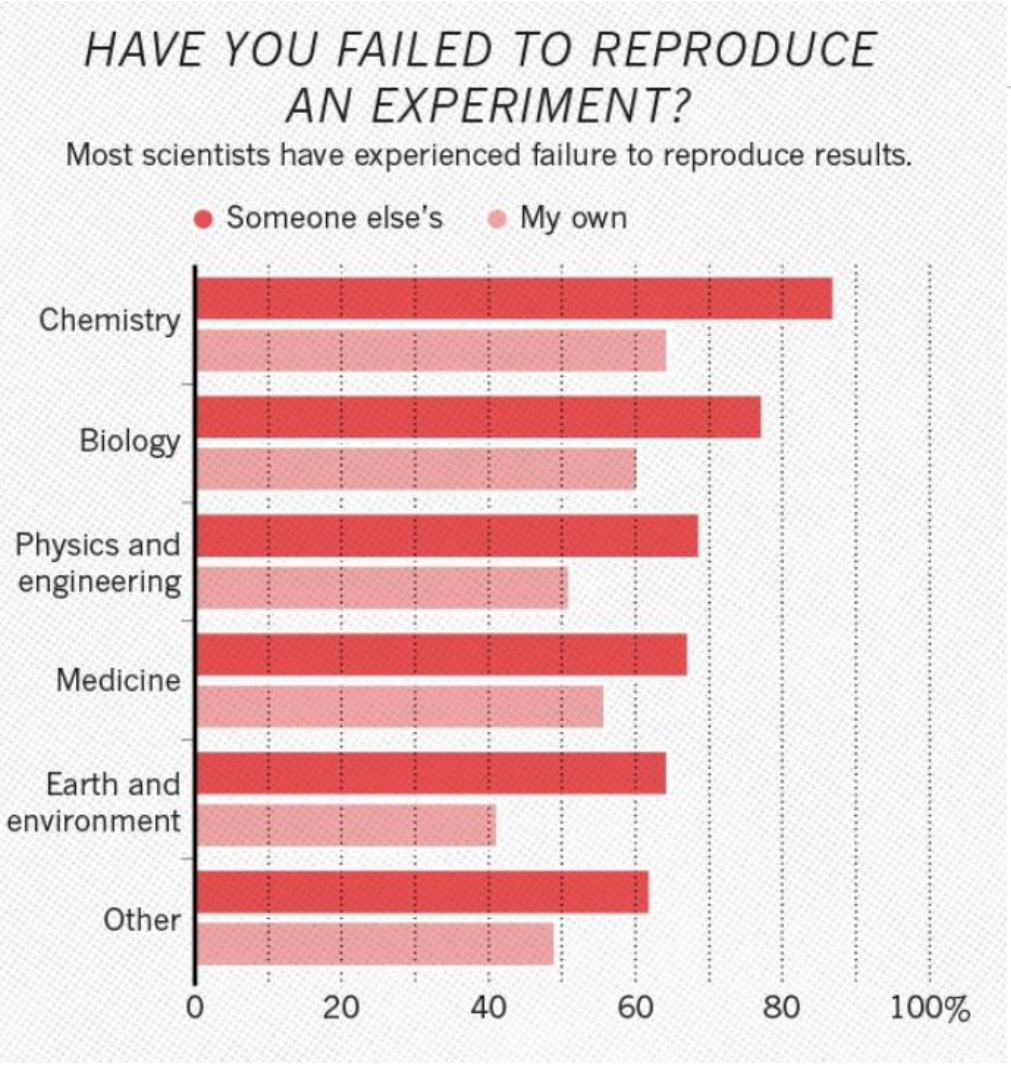
Nature 533, 452–454 (26 May 2016)
doi:10.1038/533452a



Almost **80%** of biologists fail to reproduce **someone else's results**.

60% of biologists fail to reproduce **their own results**.

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Nature 533, 452–454 (26 May 2016)
doi:10.1038/533452a

Benefit #2. You can work more reproducibly.

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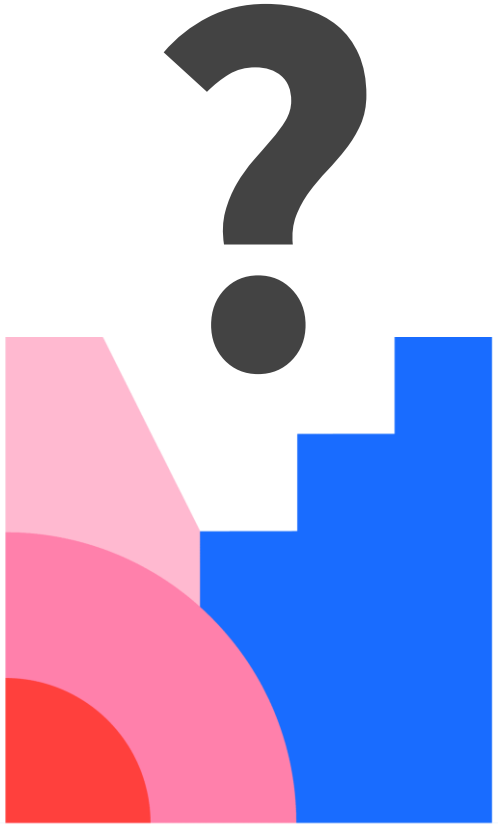

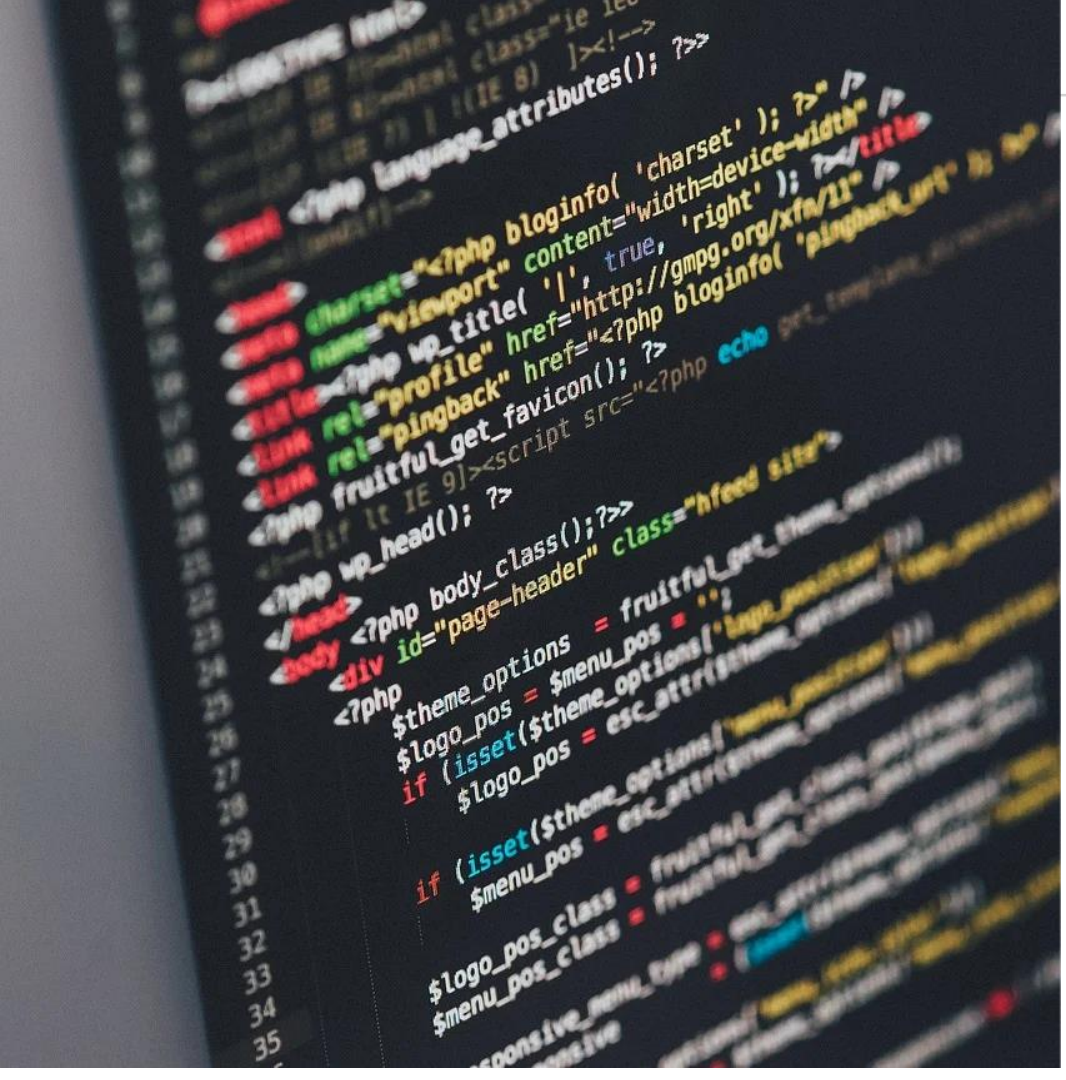

Data & code are not available.

>80% of researchers report that methods, code, raw data not being available contributes to the reproducibility crisis.

Nature 533, 452–454 (26 May 2016)
doi:10.1038/533452a

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Benefit #2. You can work more reproducibly.

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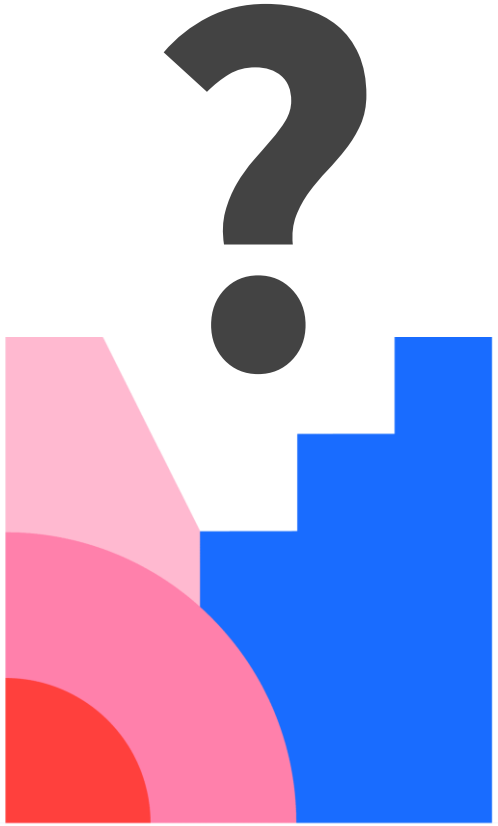

Current Biology 24, 94–97, January 6, 2014 ©2014 Elsevier Ltd All rights reserved http://dx.doi.org/10.1016/j.cub.2013.11.014

Report

The Availability of Research Data Declines Rapidly with Article Age

Timothy H. Vines,[1,2,*] Arianne Y.K. Albert,[3] Rose L. Andrew,[1] Florence Débarre,[1,4] Dan G. Bock,[1] Michelle T. Franklin,[1,5] Kimberly J. Gilbert,[1] Jean-Sébastien Moore,[1,6] Sébastien Renaut,[1] and Diana J. Rennison[1]

sets (23%) were confirmed as extant. Table 1 provides a breakdown of the data by year.

We used logistic regression to formally investigate the relationships between the age of the paper and (1) the probability

https://doi.org/10.1016/j.cub.2013.11.014

- 516 studies
- 2-22 years old

No more email requests!

Datasets ‘available upon request’ are **not available**.

Data availability declines **17%** per year

Chance of email address working declines **7%** per year

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Data sharing and reproducibility: what's in it for YOU?

Five Selfish Reasons to work reproducibly

Markowetz Genome Biology (2015) 16:274 DOI 10.1186/s13059-015-0850-7

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...Helps to avoid mistakes

- Validation & verification
- Errors can be corrected (before it's too late)

- Breast cancer studies
- Patient numbers differ
- Incorrect labelling of data
- Samples multiple times with conflicting annotation


The New York Times

How Bright Promise in Cancer Testing Fell Apart

The Annals of Applied Statistics
2009, Vol. 3, No. 4, 1309–1334
DOI: 10.1214/09-AOAS291

DERIVING CHEMOSENSITIVITY FROM CELL LINES: FORENSIC BIOINFORMATICS AND REPRODUCIBLE RESEARCH IN HIGH-THROUGHPUT BIOLOGY

BY KEITH A. BAGGERLY[1] AND KEVIN R. COOMBES[2]

University of Texas

High-throughput biological assays such as microarrays let us ask very detailed questions about how diseases operate, and promise to let us personalize therapy. Data processing, however, is often not described well enough to allow for exact reproduction of the results, leading to exercises in "forensic bioinformatics" where aspects of raw

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DOI 10.1214/09-AOAS291:

...Helps to prevent the feeling of failure!

“I can’t reproduce these results, I must be doing something wrong… I am a useless scientist!”



‘Repeat after me’
Podcast episode on reproducibility

https://fairlyopenafterdark.podbean.com/e/repeat-after-me-1618326899/

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…Helps to avoid data loss

‘My £1,000 Macbook Air was stolen at airport security and no one cares’

One traveller found that some airports can identify thieves – but do nothing to chase them or return your goods

https://www.theguardian.com/money/2018/may/04/my-1000-macbook-air-was-stolen-at-airport-security-and-no-one-cares

...Helps to avoid paper retractions

"Several concerns were raised with respect to the **veracity of the data and analyses**... We launched an independent third-party peer review... to evaluate the origination of the database elements, to confirm the completeness of the database, and to replicate the analyses presented in the paper." - Data not provided

https://doi.org/10.1016/S0140-6736(20)31180-6

Articles

Hydroxychloroquine or chloroquine with or without a macrolide for treatment of COVID-19: a multinational registry analysis

Mandeep R Mehra, Sapan S Desai, Frank Ruschitzka, Amit N Patel

RETRACTED

Summary

Background Hydroxychloroquine or chloroquine, often in combination with a second-generation m…ide, are be… widely used for treatment of COVID-19, despite no conclusive evidence of their benefit. Although …erally …e whe… used for approved indications such as autoimmune disease or malaria, the safety and bene… …treatment regimens are poorly evaluated in COVID-19.

Methods We did a multinational registry analysis of the use of hydroxychloroquine …quine with… …thout a macrolide for treatment of COVID-19. The registry comprised data from 671 hosp…s in … …ntinents. We included patients hospitalised between Dec 20, 2019, and April 14, 2020, with a positive laboratory t… …g for SARS-CoV-2. Patients who received one of the treatments of interest within 48 h of diagn… …e included in … …f four treatment groups (chloroquine alone, chloroquine with a macrolide, hydroxychlor… …ne alone, or hydroxychloroquine with a macrolide), and patients who received none of these treatments formed … control gr… Patients for whom one of the treatments of interest was initiated more than 48 h after diagnosis o… …ile they w… …on mechanical ventilation, as well as patients who received remdesivir, were excluded. The main outc… …of int… …t were in-hospital mortality and the occurrence of de-novo ventricular arrhythmias (… …tained o… …d ventricular tachycardia or ventricular fibrillation).

Findings 96 032 patients (mean age 53·8 years, 46·3… women… …OVID-19 were hospitalised during the study period and met the inclusion criteria. Of the… …patie… …were in the treatment groups (1868 received chloroquine, 3783 received chloroquine wit… …macro… …e, 3016 …eived hydroxychloroquine, and 6221 received hydroxychloroquine with a macrolide) and … …pati… …ing t… …e control group. 10 698 (11·1%) patients died in hospital. After controlling for multiple … …fou… …tors (… …sex, race or ethnicity, body-mass index, underlying cardiovascular disease and its risk fac… …diabetes… …derlying lung disease, smoking, immunosuppressed condition, and baseline disease severity), w… …mpared wi… …ortality in the control group (9·3%), hydroxychloroquine (18·0%; hazard ratio 1·335, 95%… …1·2… …457), hydroxychloroquine with a macrolide (23·8%; 1·447, 1·368–1·531), chloroquine (16·4%; 1·365, …18–1·531), …chloroquine with a macrolide (22·2%; 1·368, 1·273–1·469) were each independently associated … an increased … …f in-hospital mortality. Compared with the control group (0·3%), hydroxychloroquine (6… …; 2·36… …935–2·900), hydroxychloroquine with a macrolide (8·1%; 5·106, 4·106–5·983), chloroquine (4·3%; … …1, … …0–4·596), and chloroquine with a macrolide (6·5%; 4·011, 3·344–4·812) were independently associate… …an incr… …d risk of de-novo ventricular arrhythmia during hospitalisation.

Interpretati… …We … unable … …nfirm a benefit of hydroxychloroquine or chloroquine, when used alone or with a macro… …on it… …spital outcomes for COVID-19. Each of these drug regimens was associated with decreased in-hospit… …reased frequency of ventricular arrhythmias when used for treatment of COVID-19.

Funding Willia… …ey Distinguished Chair in Advanced Cardiovascular Medicine at Brigham and Women's Hospital.

This online publication has been corrected. The corrected version first appeared at thelancet.com on May 29, 2020

Brigham and Women's Hospital Heart and Vascular Center and Harvard Medical School, Boston, MA, USA (Prof M R Mehra MD); Sunguisphere Corporation, Chicago, IL, USA (S S Desai MD); University Heart Center, University Hospital Zurich, Zurich, Switzerland (Prof F Ruschitzka MD); Department of Biomedical Engineering, University of Utah, Salt Lake City, UT, USA (A N Patel MD); and HCA Research Institute, Nashville, TN, USA (A N Patel)

Correspondence to: Prof Mandeep R Mehra, Brigham and Women's Hospital Heart and Vascular Center and Harvard Medical School, Boston, MA 02115, USA mmehra@bwh.harvard.edu

https://doi.org/10.1016/S0140-6736(20)31958-9

Changed declarations from authors: More than one author has to have verified the data, named in contributors' statement, data sharing statement, data peer-review.

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...Helps to write papers!

- Naming convention
- Data/code secure
- Computational tools
- Automated workflow
- R, Python + note/codebooks + Git version control
- Document method

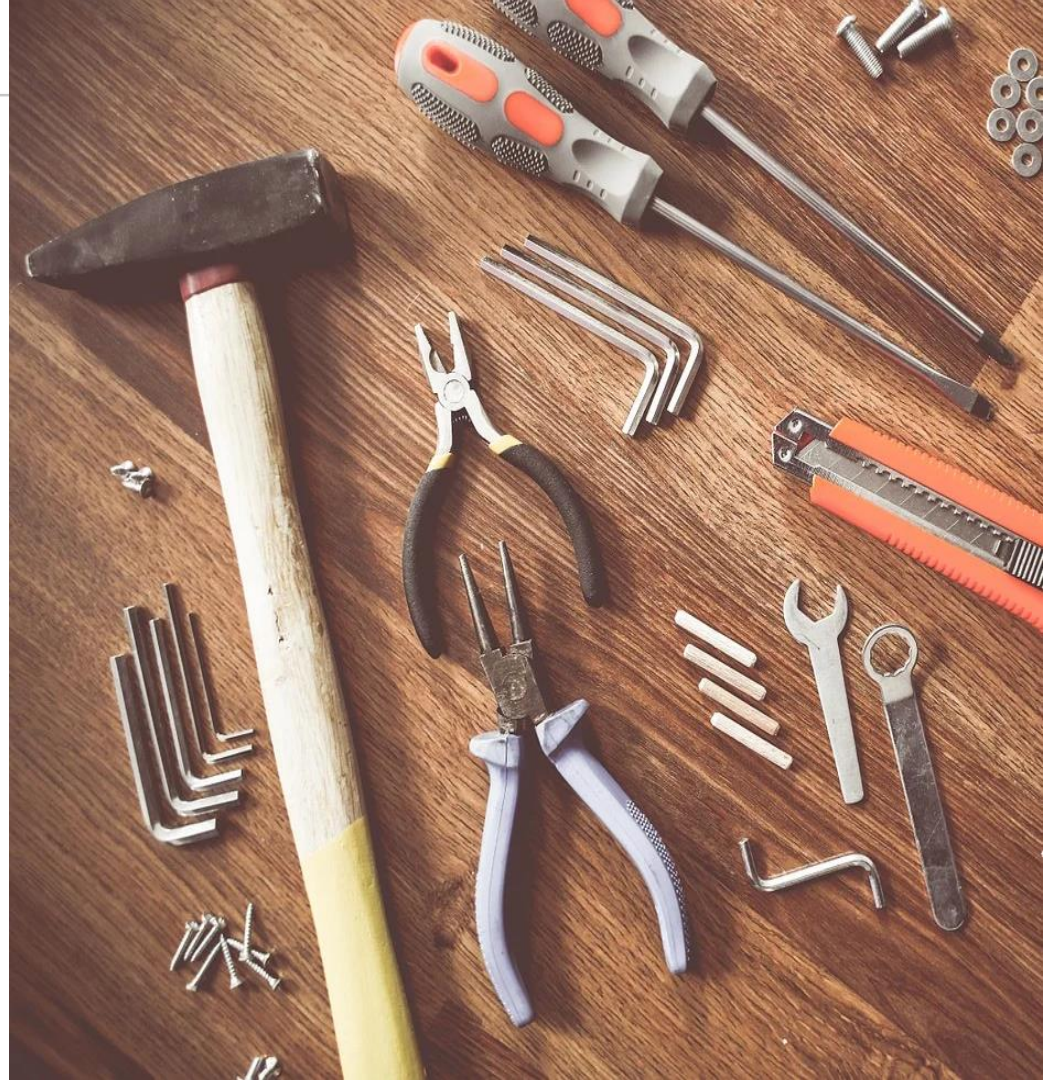
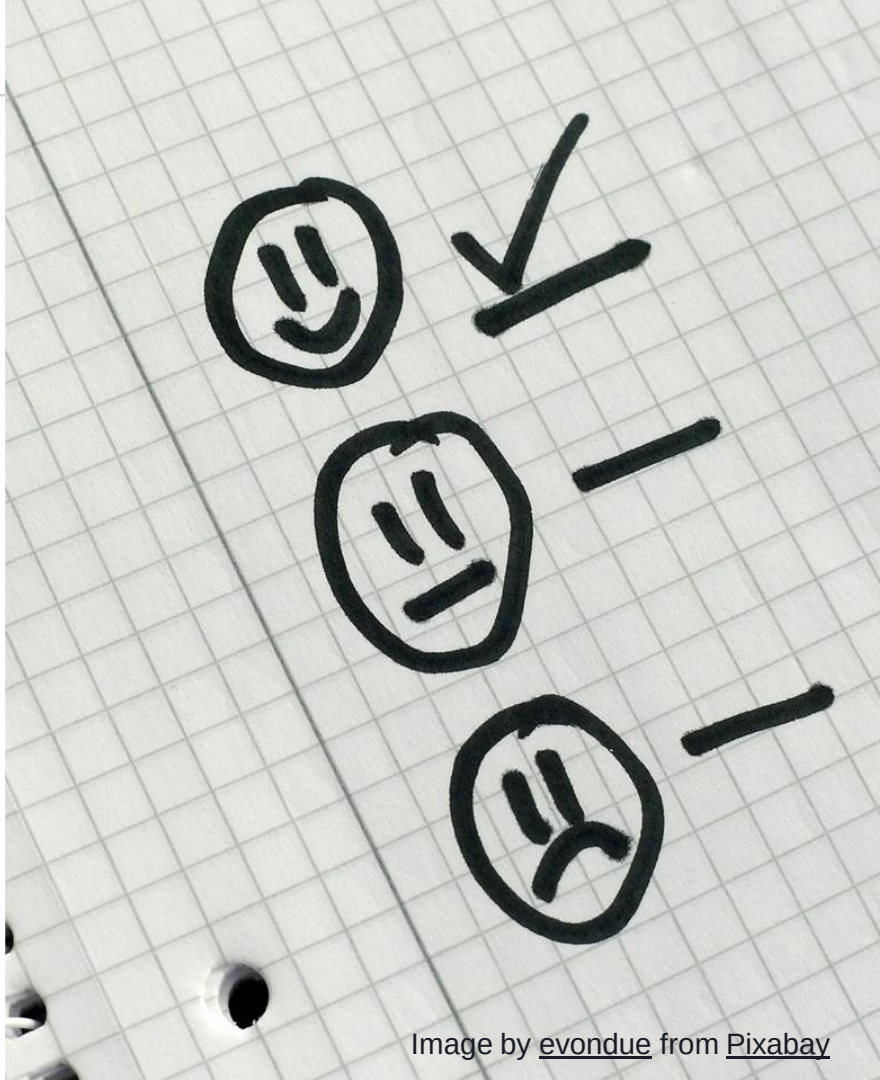


Image by free stock photos from www.picjumbo.com from Pixabay

...Helps reviewers see it your way

“The reviewers didn’t even read our paper and they had no idea what we were even doing.”

Give them access and they can check your analysis.



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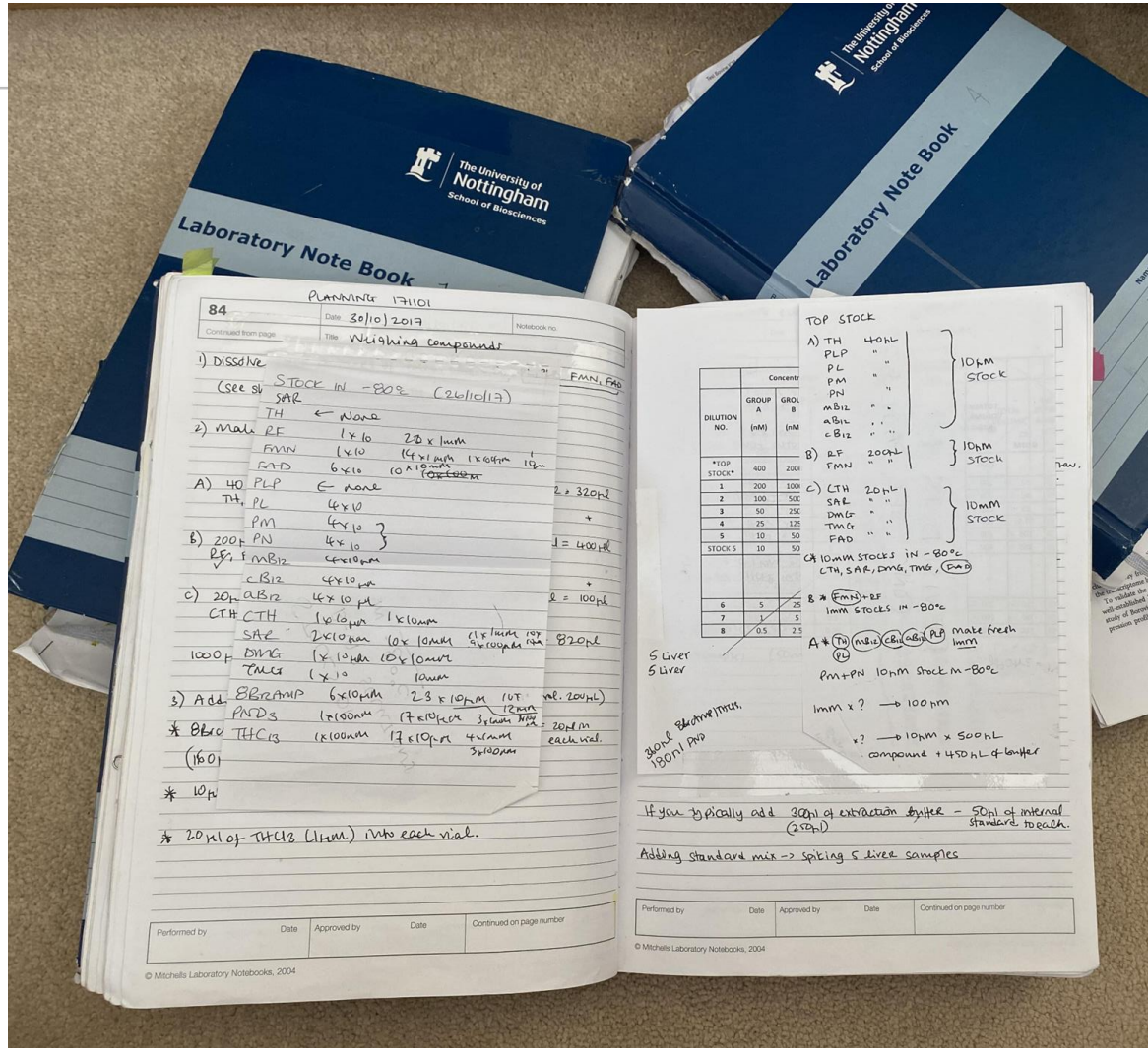
…Allows for continuity of your work

Important for PI's with **long-term** projects or for your **next grant** application



...Helps you consider ethics

- Human & animal research
  - Time
  - Cost (highly valuable)
  - Labour (consent)
- NC3Rs
  - Replacement
  - Reduction
  - Refinement

Consent to share in planning!

https://www.nc3rs.org.uk/the-3rs

Image by Tibor Janosi Mozes from Pixabay

...Helps to build your reputation

- Replication packages
- Bioconductor.org
  - Open Source software for bioinformatics
- Cite your data/code as research output!
- Boost your CV :)
- Secure your tenure position by being honest and careful

Image by Wolfgang Eckert from Pixabay

Benefit #3. Comply with policy requirements

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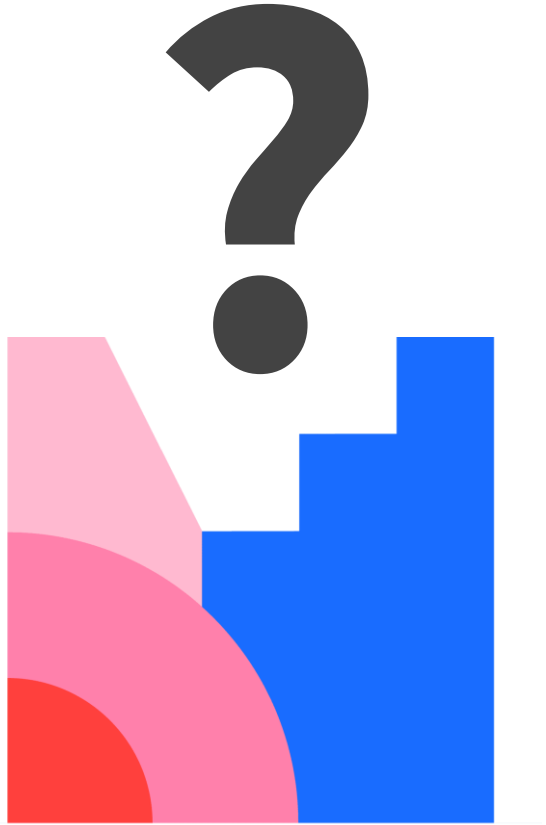

Publishers' requirements

Data and Code Deposition

Transparency and Openness promotion guidelines

As outlined in the **TOP guidelines** above, the *Science* Journals generally require all data underlying the results in published papers to be publicly and immediately available. Post-publication embargoes are not permitted, nor are stipulations for readers to contact the authors (rare exceptions involving third-party datasets must be discussed with the editor prior to publication and explained in detail in the acknowledgments). Community standards for what constitutes raw data

..

- All underlying data immediately publicly available
- Post-publication embargo not permitted
- No data availability statement permitted

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4550299/

Read the policy here: https://www.sciencemag.org/authors/science-journals-editorial-policies

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RETRACTION

Editorial retraction

Jeremy Berg, Editor-in-Chief
+ See all authors and affiliations

Science 26 May 2017:
Vol. 356, Issue 6340, pp. 812
DOI: 10.1126/science.aan5763

- Lack of ethical approval
- Absence of original data
- Lack of clarity about methodology

After an investigation, the Central Ethical Review Board in Sweden has recommended the retraction of the Report "Environmentally relevant concentrations of microplastic particles influence larval fish ecology," by Oona M. Lönnstedt and Peter Eklöv, published in *Science* on 3 June 2016 (*1*). *Science* ran an Editorial Expression of Concern regarding the Report on 1 December 2016 (*2*). The Review Board's report, dated 21 April 2017, cited the following reasons for their recommendation: (i) lack of ethical approval for the experiments; (ii) absence of original data for the experiments reported in the paper; (iii) widespread lack of clarity concerning how the experiments were conducted. Although the authors have told *Science* that they disagree with elements of the Board's report, and although Uppsala University has not yet concluded its own investigation, the weight of evidence is that the paper should now be retracted. In light of the Board's recommendation and a 28 April 2017 request from the authors to retract the paper, *Science* is retracting the paper in full.

Funders' requirements

"*Publicly funded research data are **a public good** and produced in the **public interest**. They should be **made openly available** with as few restrictions as possible in a timely and responsible manner.*"

UK Research and Innovation (UKRI)

Funder expectations

Most funders expect you to:

- **Describe** your data and/or code such that they are **understandable** by others
- Make your data and/or code **available** upon **publication**
- **Store data** and/or code for a **minimum of 10 years**
- Deposit your data and/or code in a **suitable repository** and **link** to your data and/or code in your **publication**

Examples of funders who require DMPs

Medical Research Council

Science and Technology Facilities Council

Natural Environment Research Council

Engineering and Physical Sciences Research Council

Economic and Social Research Council

National Institutes of Health

CANCER RESEARCH UK

British Heart Foundation

BILL & MELINDA GATES foundation

Arts & Humanities Research Council

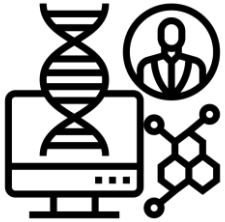
Horizon2020
European Union Funding
for Research & Innovation

Take a look at the guidelines!

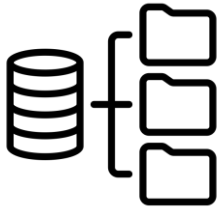
- UKRI/MRC/NERC/ESRC/EPSRC/STFC
- BBSRC
- NIH/NIHR
- CRUK
- Gates Open Research
- The British Heart Foundation
- The Wellcome Trust
- The Royal Society
- Arts and Humanities Research council
- National Science Foundation
- EC Horizon 2020
- European Research Council
- NWO

- What is a DMP?
- Why do we need DMPs?
- **What needs to be included in a DMP?**

Core elements of a data management plan

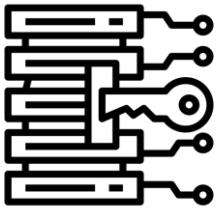


Data types



Data organisation and naming

Documentation types



Data storage and access

Data publication

Resources

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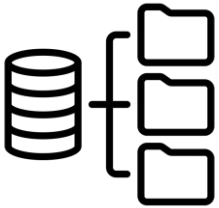
Core elements of a data management plan

Data types



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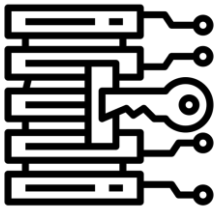
Documentation types



Data storage and access

Data publication

Resources

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Data types

- Genomic data
- Proteomic data
- Patient data
- Documentation in lab notebooks
- Protocols
- Code/scripts
- Raw instrument readings
- Images
- Tabular data (.xlsx, .txt, .csv)

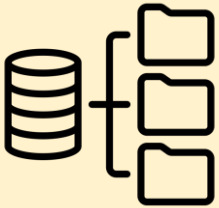
Personal data

Check usage rights

Proprietary file format

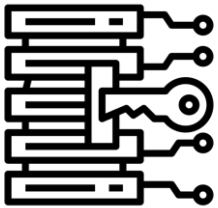
Core elements of a data management plan

Data types



Data organisation and naming

Documentation types



Data storage and access

Data publication

Resources

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Data organisation structure

- Be **consistent**
- Follow your (or your group's) **workflow**
- Be **understandable** to yourself and to your collaborators
- Include **physical samples**, e.g. bacteria, cell lines, protein, DNA, RNA samples, etc.

Example of folder structure (research compendium)

```
project-name/
├── 1-raw-data/
│   └── raw-data.csv
├── 2-scripts/
│   ├── clean-data.R
│   └── analyse-data.R
├── 3-processed-data/
│   └── processed-data.csv
├── 4-output/
│   ├── figure.jpeg
│   └── table.csv
├── 5-paper/
│   └── draft-v1.docx
├── DESCRIPTION
└── README.md
```

- Build your folder structures around **projects** and include all relevant files in this folder (and subfolders)
- Clearly **separate** data, methods, and outputs
- Keep the raw data **read-only**, i.e. never edit directly
- Define the **computational environment**
- Create **templates** (or instructions) that your group can use

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Compendium example adapted from the Turing Way (2019). Some information adapted from Marwick et al. (2018).

Naming conventions

Consider including:

- The **date** or the date range (preferably YYYYMMDD)
- The **project name**, either in full or as an acronym
- The **data type**
- The **researcher's name**, either in full or as initials
- The **experimental condition** in which the data were collected
- The file **version** (e.g., v1)

Avoid:

- Very long names
- Spaces
- Special characters (e.g., &, $, @, #, %)

Guidance adapted from https://library.stanford.edu/research/data-management-services/data-best-practices/best-practices-file-naming

File names examples

- Honeybee project, experiment 2 done in Helsinki, data file created on the 2nd of December 2020
  - File name: 20201202_HB_exp2_Hel_data_v03.xls
  - Explanation:
    Time_ProjectAbbreviation_ExperimentNumber_Location_DataType_VersionNumber

Version control system

Keep track of the changes made to files, who made them, and what the change is

For software

git

GitHub

GitLab

For data

DVC

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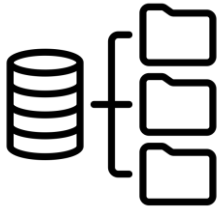
Try them out on: https://github.com , https://about.gitlab.com/ and https://dvc.org/

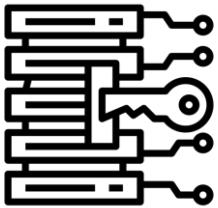
Core elements of a data management plan

Data types



Data organisation and naming

Documentation types



Data storage and access

Data publication

Resources

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README file

- Usually for documenting whole projects, but can be used for individual datasets or files
- Write it in an **open format** (e.g., .txt or .md)
- Structure it with **defined sections**:
  - General information
  - Methodological information
  - Sharing and access information
- It's a good idea to create **templates** that everyone in your group can use

Information adapted from the Cornell Research Data Management Service group guidance: https://data.research.cornell.edu/content/readme

README.md

Mode I fatigue delamination growth in composite laminates with fibre bridging

Authors: L. Yao, R.C. Alderliesten

Contact information:

General introduction

This dataset contains data collected during crack growth experiments at Delft University of Technology, as part of Liaojun Yao's PhD Thesis project (December 2015): doi:10.4233/uuid:66e210e1-c884-45d6-b9d4-711907680452

Purpose of the test campaign

The purpose of these experiments was to investigate delamination growth in CFRP composites. The Double Cantilever Beam (DCB) specimens were subjected to a variety of load cases, as detailed in "Text matrix.doc"

Test equipment

All tests were performed on a 10 kN MTS fatigue test machine. The crack length was measured by means of a camera system.

Data organisation and naming

The data included in this data set has been organised per specimen. The files follow the nomenclature system: Sp_X_Data_analysis_Y with
X = the specimen number 1 to 56
Y = indicating the number of runs with the same specimen.

General information, e.g. title, authors, contact info, and link to publication

Project context, e.g. research question

Methodological information, e.g. test equipment

Other information needed to understand the project

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Yao & Alderliesten (2015). https://doi.org/10.4121/uuid:6da548f6-f801-41b4-8d88-db9ae81f6913

Metadata - what is it?

- **“Data about data”**
- Highly **structured**
- Often **discipline-specific**, though generic metadata standards also exist
- Crucial for making your data FAIR!

Metadata - which standard?

- In most cases, the standard your chosen repository uses!
- You can also add metadata yourself in which case...
  - You can find an overview of metadata standards on the Digital Curation Centre website
    - https://www.dcc.ac.uk/guidance/standards/metadata
  - Or you can find a more thorough list on FAIRsharing.org
    - https://fairsharing.org/standards/
- You can also use a metadata editor and create a JSON file with your metadata:
  - For code: https://codemeta.github.io/codemeta-generator/
  - For data: https://create.frictionlessdata.io/

Electronic lab notebooks (ELNs)

- Enable linking of different types of data
- Are searchable
- Are not written by hand - easier to read!
- Can be shared, enabling collaboration
- Can be version controlled

Some information from: https://openworking.wordpress.com/2019/07/05/keep-calm-and-go-paperless-electronic-lab-notebooks-can-improve-your-research/
For more guidance on using ELNs: https://www.gurdon.cam.ac.uk/institute-life/computing/elnguidance
For a comparison of ELN solutions: https://datamanagement.hms.harvard.edu/electronic-lab-notebooks

Data dictionary

- For explaining variables in tabular data
- Should include:
  - Variable name
  - Variable explanation
  - Level explanation (for categorical and ordinal variables)
  - Measurement unit
  - Allowed values
  - How missing information is coded
- To make this simpler, use conventions in your fields (and vocabularies, if applicable) when structuring your data

Data dictionary example

	A	B	C	D	E	F	G	H	I	J	K
1	sample	timepoint	cont	pore_size	MHC	Naph	Phen	Anth	Fluor	Pyr	Bact
2	T1_0.1-A	1	0	0.1	0	0	0	0	0	0	0
3	T1_0.1-B	1	0	0.1	0	0	0	0	0	0	0
4	T1_0.1-C	1	0	0.1	0	0	0	0	0	0	0
5	T1_0.1+A	1	1	0.1	3600	0.21	6.1	4.5	6.4	5.8	0
6	T1_0.1+B	1	1	0.1	3600	0.16	6.1	4.5	6.2	5.7	0
7	T1_0.1+C	1	1	0.1	3100	0.14	5.3	3.9	5.2	4.8	0
8	T1_2-A	1	0	2	0	0	0	0	0	0	0
9	T1_2-B	1	0	2	43	0	0	0	0	0	0
10	T1_2-C	1	0	2	0	0	0	0	0	0	0
11	T1_2+A	1	1	2	4600	0.26	7.5	5.7			
12	T1_2+B	1	1	2	3900	0.2	6.5	4.9			
13	T1_2+C	1	1	2	3200	0.12	6.1	4.8			
14	T1_30-A	1	0	30	21	0	0	0			
15	T1_30-B	1	0	30	89	0	0	0			
16	T1_30-C	1	0	30	75	0	0	0			
17	T1_30+A	1	1	30	4000	0.21	7.1	5.6			
18	T1_30+B	1	1	30	4000	0.26	7	5.4			
19	T1_30+C	1	1	30	3500	0.18	5.9	4.5			
20	T2_0.1-D	2	0	0.1	0	0	0	0			
21	T2_0.1-E	2	0	0.1	0	0	0	0			
22	T2_0.1-F	2	0	0.1	0	0	0	0			
23	T2_0.1+D	2	1	0.1	1600	0.1	5.4	4.3			
24	T2_0.1+E	2	1	0.1	1600	0.089	4.1	3.5			
25	T2_0.1+F	2	1	0.1	1400	0.073	5.2	4.3			
26	T2_2-D	2	0	2	0	0	0	0			

File Edit Format View Help

```
Timepoint: 1: six weeks; 2: three months; 3: six months
cont: 0: non-contaminated, 1:contaminated
pore_size: in micrometers (filter)
All chemical data are in mg/ Kg soil
MHC: Mineral Hydrocarbons
Naph: Naphtalin
Phen: Phenanthren
Anth: Anthracen
Fluor: Fluoranthen
Pyr: Pyren
Bact: 16S rRNA copies/ gr soil; primers: XXXX (Ref)
```

Data dictionary example

	A	B	C	D	E	F	G	H	I	J	K
1	sample	timepoint	cont	pore_size	MHC	Naph	Phen	Anth	Fluor	Pyr	Bact
2	T1_0.1-A	1	0	0.1	0	0	0	0	0	0	0
3	T1_0.1-B	1	0	0.1	0	0	0	0	0	0	0
4	T1_0.1-C	1	0	0.1	0	0	0	0	0	0	0
5	T1_0.1+A	1	1	0.1	3600	0.21	6.1	4.5	6.4	5.8	0
6	T1_0.1+B	1	1	0.1	3600	0.16	6.1	4.5	6.2	5.7	0
7	T1_0.1+C	1	1	0.1	3100	0.14	5.3	3.9	5.2	4.8	0
8	T1_2-A	1	0	2	0	0	0	0	0	0	0
9	T1_2-B	1	0	2	43	0	0	0	0	0	0
10	T1_2-C	1	0	2	0	0	0	0	0	0	0
11	T1_2+A	1	1	2	4600	0.26	7.5	5.7			
12	T1_2+B	1	1	2	3900	0.2	6.5	4.9			
13	T1_2+C	1	1	2	3200	0.12	6.1	4.8			
14	T1_30-A	1	0	30	21	0	0	0			
15	T1_30-B	1	0	30	89	0	0	0			
16	T1_30-C	1	0	30	75	0	0	0			
17	T1_30+A	1	1	30	4000	0.21	7.1	5.6			
18	T1_30+B	1	1	30	4000	0.26	7	5.4			
19	T1_30+C	1	1	30	3500	0.18	5.9	4.5			
20	T2_0.1-D	2	0	0.1	0	0	0	0			
21	T2_0.1-E	2	0	0.1	0	0	0	0			
22	T2_0.1-F	2	0	0.1	0	0	0	0			
23	T2_0.1+D	2	1	0.1	1600	0.1	5.4	4.3			
24	T2_0.1+E	2	1	0.1	1600	0.089	4.1	3.5			
25	T2_0.1+F	2	1	0.1	1400	0.073	5.2	4.3			
26	T2_2-D	2	0	2	0	0	0	0			

File Edit Format View Help

Timepoint: 1: six weeks; 2: three months; 3: six months
cont: 0: non-contaminated, 1:contaminated
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Pyr: Pyren
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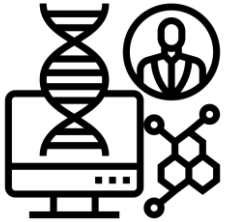
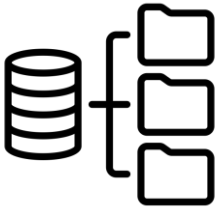
Core elements of a data management plan

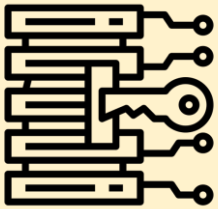


Data types



Data organisation and naming

Documentation types



Data storage and access

Data publication

Resources

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Data storage and access during the project

- Where will you **store** the data?
  - Does this storage option allow your collaborators to access the data?
  - Is this storage option safe for confidential data?
- How will you **backup** the data?
  - Is the backup reliable?

Always back up the data!

3 copies of the data

2 storage devices

1 off-site location

Storage + Backup

- Universities often have **drives** that:
  - Are **safely stored** on university servers
  - Are **backed up daily** (also to different locations) and
  - Offer different **access options**
- Ask your librarian or IT services what the recommended solution is at your institution!

Check the Terms of Service for commercial cloud solutions!

Rights

This license allows Google to:

- host, reproduce, distribute, communicate, and use your content — for example, to save your content on our systems and make it accessible from anywhere you go
- publish, publicly perform, or publicly display your content, if you've made it visible to others
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- sublicense these rights to:
  - other users to allow the services to work as designed, such as enabling you to share photos with people you choose
  - our contractors who've signed agreements with us that are consistent with these terms, only for the limited purposes described in the Purpose section below

! Not suitable for **confidential data**

! Check where the data is **stored**

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You can read the Terms of Service here: https://policies.google.com/terms#toc-permission

Safer cloud storage solutions - NL

SURF

SURFdrive: store and share your files securely in the cloud

Store, synchronise and share your documents easily with SURFdrive. SURFdrive is a personal cloudservice for the Dutch education and research. Your documents are kept safe and sound in our communitycloud.

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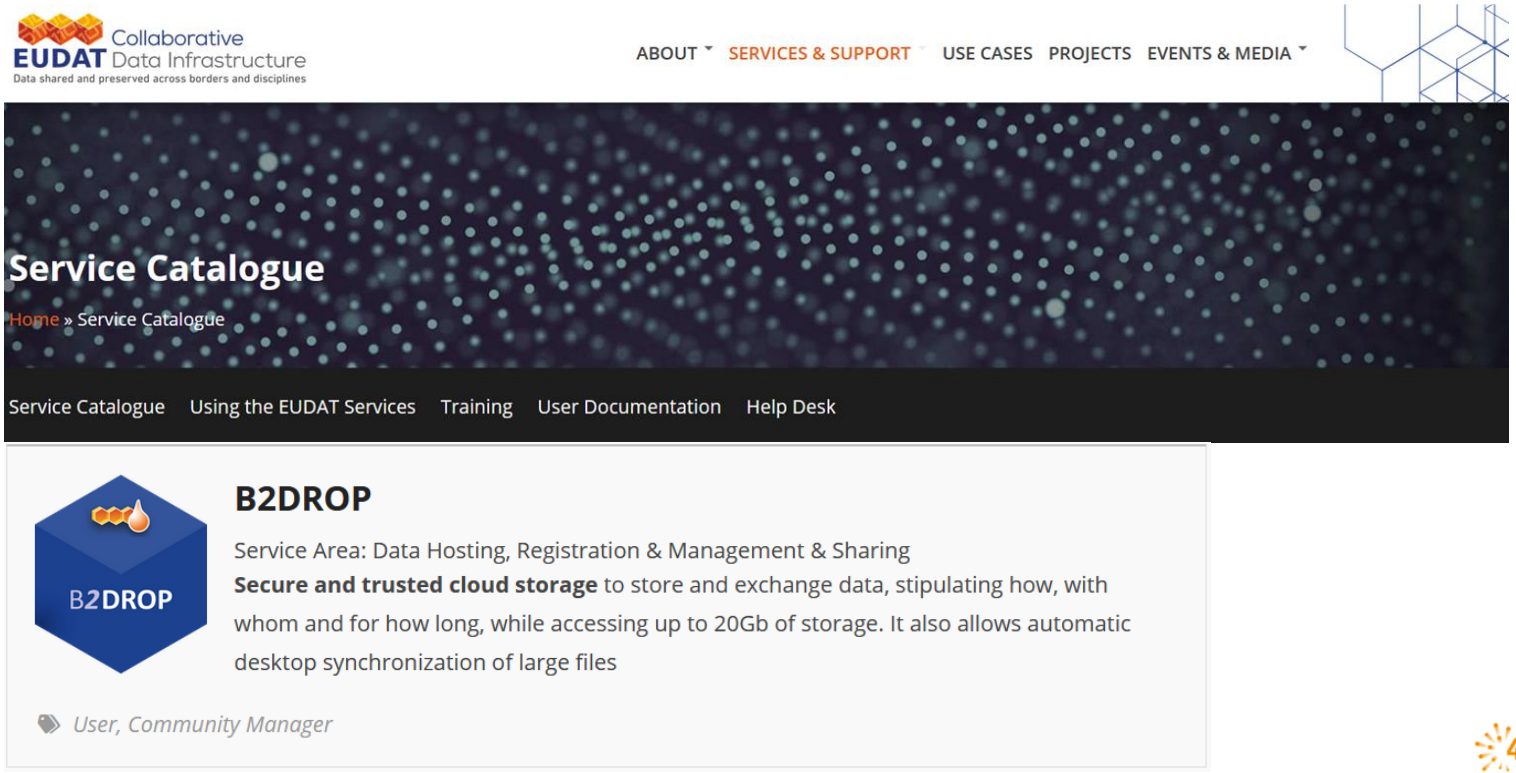
Check it out here: https://www.surf.nl/en/surfdrive-store-and-share-your-files-securely-in-the-cloud/surfdrive-for-users?dst=n3922

Safer cloud storage solutions - EU



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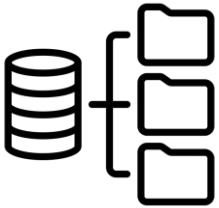
Check out all the EUDAT services here: https://www.eudat.eu/catalogue

Core elements of a data management plan

Data types



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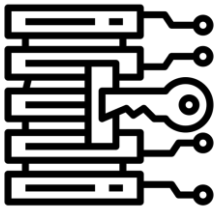
Documentation types



Data storage and access

Data publication

Resources

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Data and code publishing

- Will you experience any **problems** with publishing data and/or code?
- **Where** will you publish the data and/or code of the project?
- Are your plans in line with your **funders' expectations**?

Data and code publishing

- **Will you experience any problems with publishing data and/or code?**
- **Where** will you publish the data and/or code of the project?
- Are your plans in line with your funders' expectations?

Data types & publication complications

- Genomic data
- Proteomic data
- Patient data
- Documentation in lab notebooks
- Protocols
- Code/scripts
- Raw instrument readings
- Images
- Tabular data (.xlsx, .txt, .csv)

Personal data

Check usage rights

Proprietary file format

Problems with data and/or code publication

Personal data

Confidential data

Check usage rights

Proprietary file format

- Get **consent** to publish
- **Aggregate** to remove confidential information
- **Anonymise** (e.g. see *Amnesia*)

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Check out Amnesia from OpenAIRE on https://amnesia.openaire.eu/

Problems with data and/or code publication

Personal data

Confidential data

Check usage rights

Proprietary file format

- Check the **licence** under which the data or code you are reusing was shared

Problems with data and/or code publication

Personal data

Confidential data

Check usage rights

Proprietary file format

- Convert to an **open file format**

Data and code publishing

- Will you experience any **problems** with publishing data and/or code?
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Photo by Jan Antonin Kolar on Unsplash

A repository is a place where things can be stored and shared

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The benefits of using a repository

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SCIENCE • ENGINEERING • DESIGN

STORM IBTrACS present climate synthetic tropical cyclone tracks

Cite | Download all (517.94 MB) | Share | Embed | + Collect

2130 views | 4139 downloads | 5 citations

Version 3 Dataset posted on 18.03.2021, 15:40 by Nadia Bloemendaal, I.D. (Ivan) Haigh, H. (Hans) de Moel, S Muis, R.J. (Reindert) Haarsma, J.C.J.H. (Jeroen) Aerts

Datasets consisting of 10,000 years of synthetic tropical cyclone tracks, generated using the Synthetic Tropical cyclOne geneRation Model (STORM) algorithm (see Bloemendaal et al, Generation of a Global Synthetic Tropical cyclone Hazard Dataset using STORM, in review). The dataset is generated using historical data from IBTrACS and resembles present-climate conditions. The data can be used to calculate tropical cyclone risk in all (coastal) regions prone to tropical cyclones.

VERSION UPDATE (30 Sept 2020): The Saffir-Simpson category thresholds were wrongly calculated in the previous version, this has now been corrected.

VERSION UPDATE (18 March 2021): The old version of STORM contained some duplicate cyclone tracks. These have now been removed.

Read the peer-reviewed publication

Generation of a global synthetic tropical cyclone hazard dataset using STORM

4TU.ResearchData
SCIENCE • ENGINEERING • DESIGN

Check it out on: https://doi.org/10.4121/12706085.v3

The benefits of using a repository - description

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The benefits of using a repository - version control

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The benefits of using a repository - downloads

STORM IBTrACS present climate synthetic tropic

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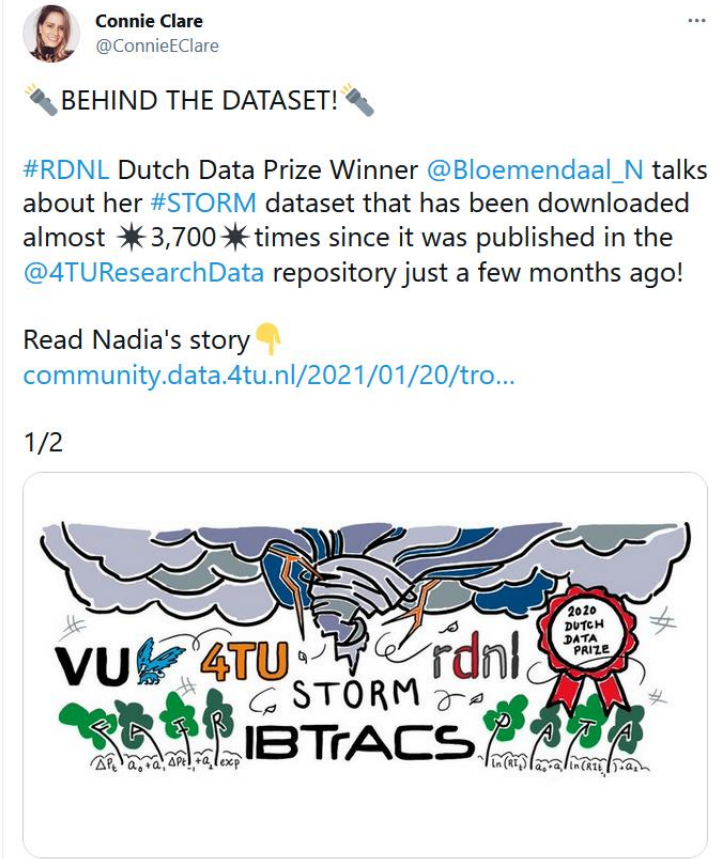

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The benefits of using a repository - citations

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DataCite

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TIPS

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Version 3 Dataset posted on 18.03.2021, 15:40 by Nadia Bloemendaal, I.D. (Ivan) Haigh, H. (Hans) de Moel, S Muis, R.J. (Reindert) Haarsma, J.C.J.H. (Jeroen) Aerts

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Check it out on: https://doi.org/10.4121/12706085.v3

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Check it out for yourself: https://zenodo.org/

Repositories for datasets

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UniProt
IDR
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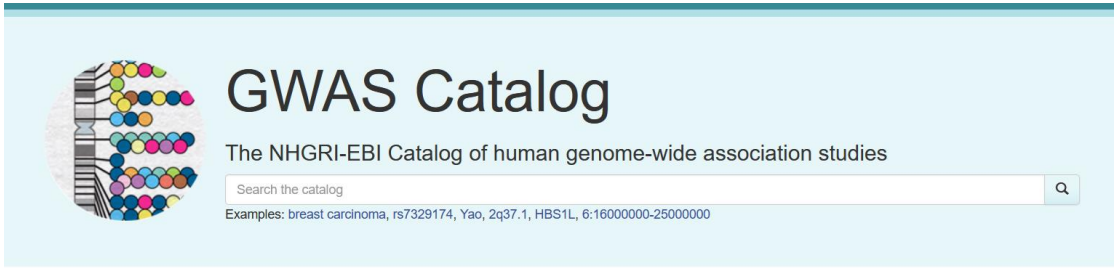

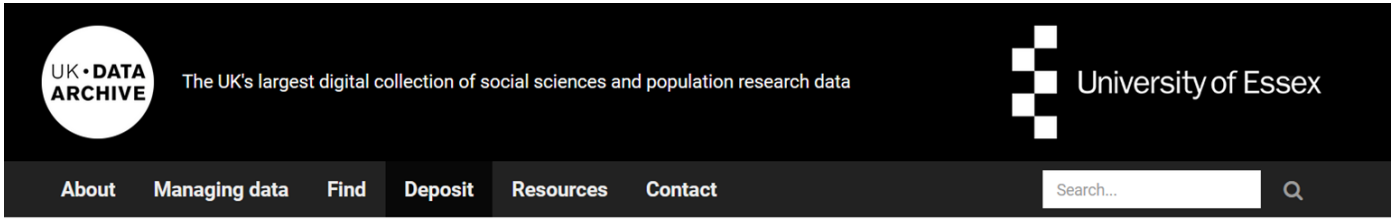

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Check them out on: https://www.ebi.ac.uk/gwas/ and http://www.data-archive.ac.uk/deposit

Data repository for images

Check it out on: https://idr.openmicroscopy.org/about/about.html

Institutional (data) repositories

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Check them out on: https://edmond.mpdl.mpg.de/imeji/ and https://www.repository.cam.ac.uk/

Repositories for software

+

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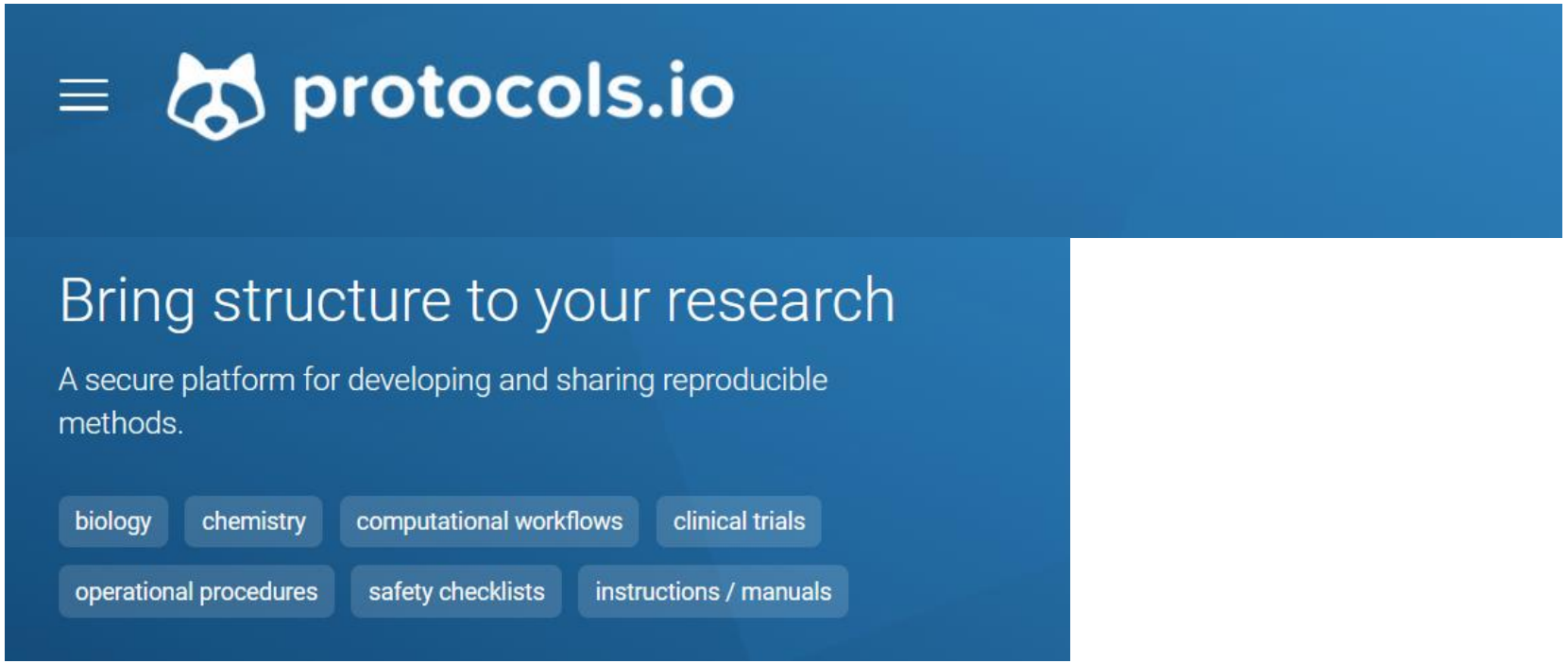
Read how on this guide from GitHub: https://guides.github.com/activities/citable-code/

Repositories for protocols



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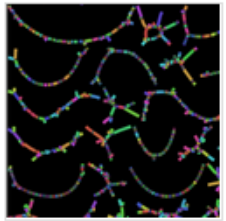
Check it out on: https://www.protocols.io/

Repositories for protocols

protocols.io



Mar 06, 2017

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De novo transcriptome assembly workflow

Scientific Reports

Jared Mamrot[1], Roxane Legaie[1], Stacey J Ellery[1], Trevor Wilson[1], Torsten Seemann[1], David Gardner[1], David W Walker[1], Peter Temple-Smith[1], Anthony T Papenfuss[1], Hayley Dickinson[1]

[1]Hudson Institute of Medical Research

Other Share dx.doi.org/10.17504/protocols.io.ghebt3e

Science accelerator

Jared Mamrot
Hudson Institute of Medical Research

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Check it out on: https://www.protocols.io/view/de-novo-transcriptome-assembly-workflow-ghebt3e?step=1

Repositories for protocols

Import and organise raw data

1 Download raw data from the NCBI to working directory and archive a copy (read-only). To efficiently transfer data the NCBI recommends using Aspera connect, a FASP® transfer program which facilitates high-speed data transfer.

Decompress and examine RNA-Seq read quality

2 Decompress gzipped files (*.gz), and use FastQC for preliminary read quality assessment. GNU zip (gzip) is a popular compression utility free from patented algorithms. FastQC is a quality control tool for high throughput sequence data which assesses multiple metrics and provides a QC report.

Trim adapters and re-examine read quality

3 Trim_galore is a tool that implements cutadapt to consistently apply quality and adapter trimming to FastQ files: it seeks out and removes adapter sequences from RNA-Seq data.

Check it out on: https://www.protocols.io/view/de-novo-transcriptome-assembly-workflow-ghebt3e?step=1

Publish protocols with protocols.io and PLOS ONE

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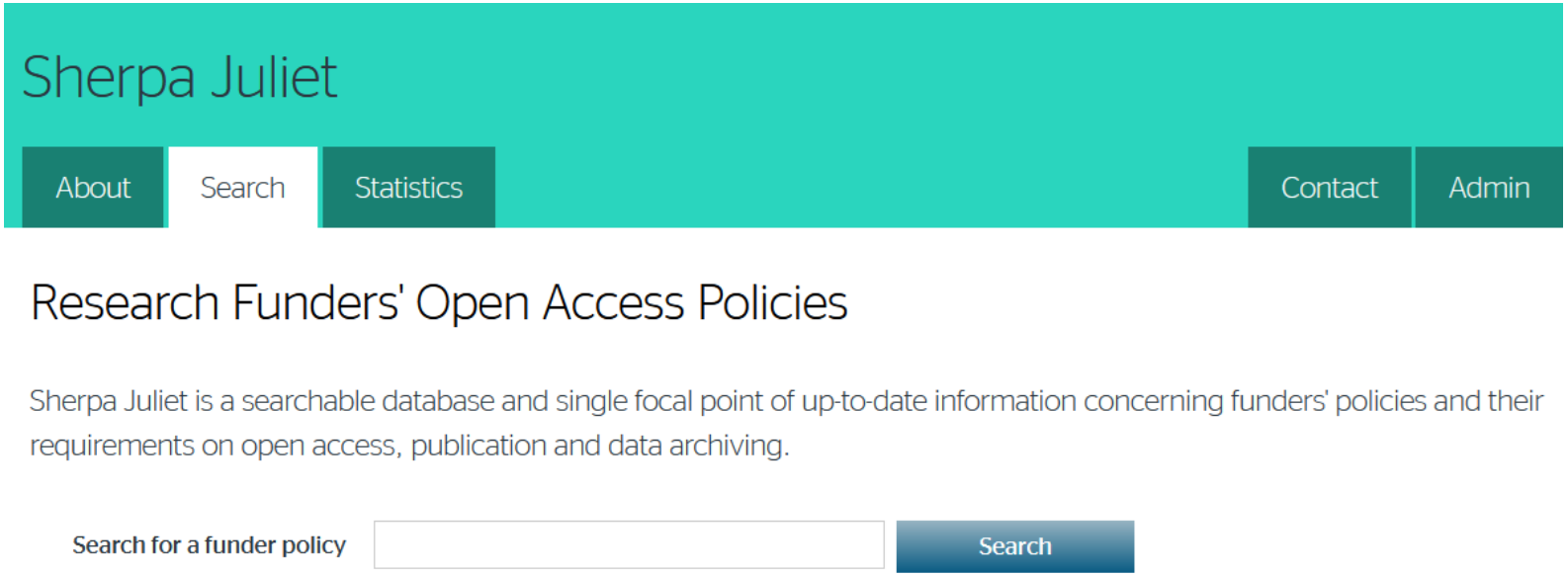
Check it out on: https://plos.org/protocols/

Data and code publishing

- Will you experience any **problems** with publishing data and/or code?
- **Where** will you publish the data and/or code of the project?
- **Are your plans in line with your funders expectations?**

Check funder expectations



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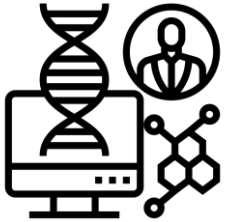
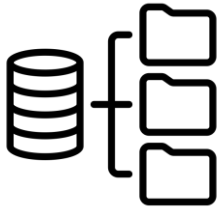
You can try it out on: https://v2.sherpa.ac.uk/juliet/

Core elements of a data management plan

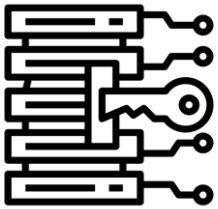


Data types



Data organisation and naming

Documentation types



Data storage and access

Data publication

Resources

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People resources

How will you put your data management plan into practice?:

- Who will be responsible for which aspect of the data management?
- Will you appoint a dedicated **data manager?**
- Will there be any **quality checks** for data collection and analysis in your group?

How to estimate people resources?

The Data Management Costing tool from 4TU and TU Delft helps you figure out data management **costs** and **staff requirements**.

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Try it out on http://bit.ly/RDMcosting

Additional resources

- Costs of active **data storage**: consult your IT support
- Costs of **software licences to support** data management, e.g. Electronic Lab Notebooks
- Costs of **long-term preservation**: some repositories might charge to ensure sustainability

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For more guidance see: https://www.uu.nl/en/research/research-data-management/guides/costs-of-data-management

Reflections…

Head to www.menti.com

Use code: 3888 8929


Q&A!
15:00 - 15:20

Create an account with DMPonline

DMPONLINE Home Public DMPs Funder requirements Help

Plan to make data work for you

Data Management Plans that meet institutional funder requirements.

DMPonline helps you to create, review, and share data management plans that meet institutional and funder requirements. It is provided by the Digital Curation Centre (DCC).

Sign in | Create account

* First Name

* Last Name

* Email

* Organisation

Begin typing to see a list of suggestions.

* Password

☐ Show password

* ☐ I accept the terms and conditions

Create account

Part II:
How to create a DMP

- **Demo of DMP online (5 min)**
- Create a DMP using DMPonline (30 min)
- Peer-review your colleagues DMP (15 min)
- Wrap-up!

Part II:
How to create a DMP

- Demo of DMP online
- **Create a DMP using DMPonline**
- Peer-review your colleagues DMP

Exercise 1 - Create a plan

- Sign in to DMPonline on https://dmponline.dcc.ac.uk/
- Click on ‘Create a plan’
- Think of a project you want to get funding for
- For this exercise, select the funder ‘Science Europe’
- Answer the questions of the plan (note you won’t be able to finish!)…
- You can look at the example DMP if you get stuck (link in chat)!
- … **and be prepared to share!**

If you have any questions, **post them in the chat!**

30 minutes

Part II:
How to create a DMP

- Demo of DMP online
- Create a DMP using DMPonline
- **Peer-review your colleagues DMP**

Exercise 2 - Share and review plans

- Here are your partners:
  - …

- Invite your partner as a collaborator (with edit access)
- Review each other's plans and give suggestions

15 minutes

Reflections…

Head to www.menti.com

Use code: 3888 8929

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Thank you!

Any questions?